

smaller in the photographs than it did on the ground glass of the camera.

The latitude of Dunecht by transit-circle observations is $57^{\circ} 9' 36''$; the longitude, taken from the Ordnance Survey map, is $9^{\text{m}} 40^{\text{s}}$ west of Greenwich. The time was determined with the transit circle on several nights both before and after the day of the transit. Unless otherwise stated, the times are given in Dunecht sidereal time.

Dunecht, June 12, 1878.

Observations of the Transit of Mercury of 1878, May 6.

By A. C. Ranyard, Esq.

The transit was observed by me at Dunecht. Lord Lindsay kindly gave me the use of his 15-inch refractor, which was stopped down to ten inches during the observation, in order to avoid all chance of damaging the eye-pieces or dark shades by the Sun's heat. On one of the finders was a spectroscope, with a single compound prism, by Grubb, with a dispersion of $5^{\circ} 56'$ from *B* to *h*. On the other finder was a low-power eye-piece, with cross wires, which were brought into accurate collimation with the centre of the slit of the spectroscope. On the large instrument was a *Menz* polarising eye-piece, giving a power of 244.

As the planet came up to the Sun's limb, from about ten minutes before the time of predicted contact, I observed the spectrum of the sky in the direction in which the planet was approaching. The viewing telescope of the spectroscope was turned so that the red end of the spectrum below *C* was in the field of view, and the slit of the spectroscope, which subtended an arc of $5' 45''$ upon the Sun, was nearly at right angles to the path of the approaching planet. The slit was swept outward in right ascension over the path of the planet, and any variation in the brightness of the field corresponding to the place of the planet was carefully looked for. My reason for attempting this observation was that M. Janssen, in observing the transit of *Venus*, thought that by making use of a screen of blue glass he had been able to detect the body of the planet projected upon the background of the corona some time before it was visible without the screen. As far as I am aware, there are no observations which indicate that the spectrum of the lower parts of the corona is richer in blue rays than the spectrum of the light derived from the veil of illuminated particles floating in our own atmosphere, which under ordinary circumstances hides the corona from our view. Indeed the evidence is rather in the contrary direction, for Mr. Stone, observing during the total eclipse of April 1874, was of opinion that the continuous spectrum of the lower parts of the corona was rich in red light. I therefore

thought it better to examine the red end of the spectrum, but I did not succeed in detecting any indication of the position of the planet before it came up to the Sun's limb. It should, however, be remembered that the sky was until first contact covered with thin clouds, which were at times sufficiently thick greatly to diminish the Sun's light.

I continued my observations at the spectroscope until some time after the signal for first contact had been given, and having satisfied myself that I could not see any longitudinal streak or variation in the brightness of the spectrum corresponding to the outer limb of the planet in the field of the spectroscope, I turned to the larger instrument with the Merz polarising eye-piece.

The planet had now entered quite one-third of its diameter upon the Sun's disk, and the sky was rapidly clearing, but I was unable to see any trace of the outer limb or any portion of the planet which was not projected upon the Sun's disk.

I then passed back again to the spectroscope and watched until the planet was about two-thirds upon the Sun's disk, but saw nothing to indicate the position of the outer limb in the field of the spectroscope.

On turning again to the large instrument with the Merz eye-piece, only a small arc of the planet remained off the Sun's disk. The sky was now clear and the definition was very good, but I could not see any trace of the part of the planet off the Sun, and I certainly could not see any line of light around the outer limb of the planet as described by some of the transit of *Venus* observers. I continued to watch with the Merz eye-piece turning the field alternately brighter and darker until the planet was entirely upon the Sun's disk, and I gave the signal for geometrical contact at the moment when the disk of *Mercury* and the disk of the Sun appeared to have a common tangent. There was no sticking or any appearance that could be described as a black drop, and in another second—certainly in less than two seconds—after the signal I saw a bridge of light separating the planet from the Sun's limbs. The time of my signal as taken down by an assistant, who, however, neglected to observe the minute, corresponds to $6^h [2^m] 15^s.5$ Dunecht sidereal time. When *Mercury* was upon the Sun's disk I carefully looked for rings round the planet and for the spot of light which has been observed in former transits upon the disk, but could not detect any trace of either the rings or the spot of light; but in observing afterwards with a cardboard diaphragm of less than an inch in diameter upon the instrument used by Dr. Copeland I thought that I at times saw a greyish ring round the planet, but did not feel quite certain as to its existence.

When the planet was well advanced upon the Sun's disk, the slit of the spectroscope was placed so as to bisect the disk of the planet, and the black band, which was then visible running longitudinally across the field of the spectroscope, was carefully examined; but neither Dr. Copeland, who assisted me in this

observation, nor I, could detect any alteration in the solar spectrum at the edges of the band. The slit of the spectroscope was then shifted by pressure upon the side of the instrument until the slit cut off a small arc or was nearly tangential to the disk of the planet, but no changes in the solar spectrum at the edges of the band could be perceived.

The difficulties of the observation (owing to the small magnifying power and to the atmospheric tremor) were, however, so great that no reliance must be placed on this observation as affording any but the roughest evidence that the planet has not a very large absorbing atmosphere.

In the evening after the transit the collimation of the spectroscope and finder was tested upon a star and found not to have shifted, so that there can be little doubt that the slit was swept over the place of the planet as it came up to external contact.

Observations of the Transit of Mercury, 1878, May 6.

By Maxwell Hall, Esq.

(*Extract from a Letter to the Astronomer Royal.*)

The transit of *Mercury* was observed here yesterday under circumstances well worth your consideration. The Ingress was obscured by a cloud, but the Egress showed that no reliance could be attached to the estimated times of the various phases of contact, δ , ϵ , ζ , geometrical contact and bisection; they were all so linked together that the time of any phase was liable to an error of about 10 seconds.

A party of ladies and gentlemen assembled here to see the transit, and the results are most curious and entertaining. With a low power of 55 most of us saw a ring of light, brighter than the surface of the Sun, surrounding the black disk of *Mercury*; with a higher power of 120 some of us saw both the ring and a bright central spot, some saw only the ring, some only the spot, and some neither. With a power of 200 I myself distinctly saw the spot in the form of a *small and narrow ring* of light, concentric with the black disk of *Mercury*, and about 5'' in diameter; but with this power I found that the *exterior ring had vanished*.

The sketch made by Dr. Huggins during the transit of *Mercury* in 1868 (*Monthly Notices*, vol. xxix., p. 27) was carefully compared with what we saw with the intermediate power, and, excepting the eccentric position of the bright spot in that sketch, it was generally approved of as representing our combined descriptions.

There cannot therefore be the least doubt that these appearances are merely optical; and they were only seen by those who had the more delicate eyesight.